NUMERAL SYSTEMS OF THE LANGUAGES OF CALIFORNIA

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In examining the tables of numerals from Californian languages which constitute this contribution, it must be borne in mind that they belong to more than twenty different linguistic families. After this fact is taken into consideration as regards their lack of uniformity, there still remain great discrepancies between the numerals of dialects and languages belonging to one family. It is especially striking that these differences within a family are often not so much phonetic or dialectic as due to a different radical derivation of the numerals. When it is remembered how uniformly the same radicals appear, throughout the great Indo-European family, in languages that are not only mutually unintelligible, but so different that their common origin would not be suspected but for study, the frequency with which, in California, languages that the Indians recognize as akin and which are in part mutually intelligible, show three or four or more radical differences in their first ten numerals, is a remarkable feature of these numeral systems.

This diversity is due to the nature of the formation of the numerals. In the languages of civilization the radicals of numeral words up to ten are meaningless save for their numerical significance ; the same is true of the higher units of counting, and all the remaining words are formed directly from combinations of these without the use of nouns or verbs. In the languages of the California Indians most of the numerals above ten, and many of those above five, are not radicals but derivative words. These derivative words are partly arithmetical, as two-two for four ; partly composite words, like fin-

ished-hand for five, denoting objects or actions expressive of the process of counting. The expression by numerals of an arithmetical process is not foreign to Indo-European, and obviously can be absent from no language; thirteen, seventy-one, two hundred and five, as much as undeviginti, and quatre-vingt-dix-sept, are based altogether on a few primary radicals and on mathematical processes. The difference between our languages and those of the California Indians is that we restrict such descriptive terms to the numbers above ten and do not in the formation of the derived words depart from abstract mathematical processes ; whereas they begin mathematical operations not infrequently with so low a number as four, and in many cases cling to concrete arithmetical operations in their counting.

While both these characteristics, compound numerals for very low numbers, and the use of words denoting visible things or acts to express them, are often accompanied by an unpracticed counting sense, this is not the case among the California Indians. The Australians and South Americans who count 1, 2, 2-1, 2-2, 2-2-1, or 1, 2, 3, 2-2, 3-2, for obvious reasons do not continue this method very far. Every Californian language of which anything can as yet be positively said in this respect, counted into the hundreds when desired, though it does not follow from this, as Conant has pointed out as a general fact among primitive people, that such ability to form and use comparatively high numbers carries with it a very definite idea of these numbers as such. However primitive numerical processes were in California, they were not rudimentary.

The following are the processes that exist in the numeral systems of California:

Quinary. — This fundamental process is common in California, but cannot be said to predominate. Two phases of it must be distinguished. First, and less distinctive, the quinary process below ten only, the numerals from six to nine being formed on a quinary basis, but those from ten to twenty being formed from those below ten added directly to the word for ten or an equivalent; so that from ten on a decimal method replaces the quinary. Second is a form of the quinary process continued to twenty, or even above ; five, ten, fifteen, and twenty serving as the bases from which the

intervening numerals are formed either by addition or subtraction. This method, which is shown by Nahuatl and Eskimo, is the most complete type of quinary numeration.   In cases where the numbers
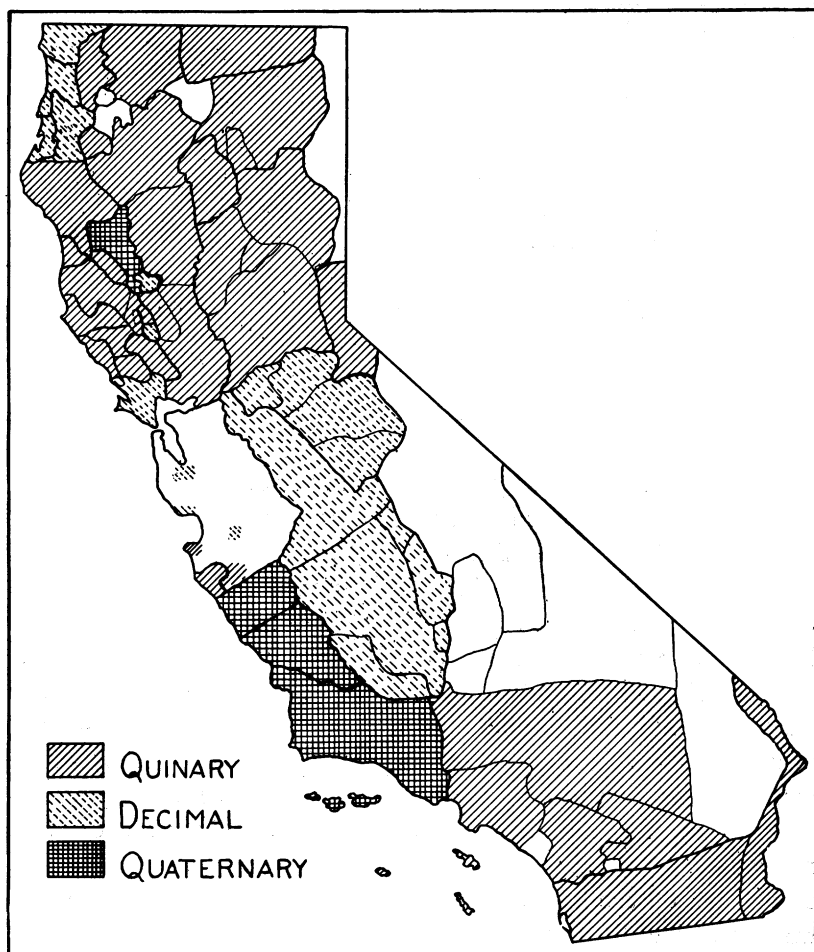

FIG. 40. — Distribution of Methods of Counting from One to Ten in California.

above twenty appear not to have been much used, or where other causes were operative, as in certain Californian languages, the method of counting by fives is carried on indefinitely until it becomes too cumbersome ; but more frequently twenty is taken as the unit of the

next higher order and the well-known quinary-vigesimal system results.

Decimal. — From the nature of things the decimal system is farther removed from concrete groupings, or other tangible or dynamic operations in counting, than the quinary. It must not be supposed however, from analogy with our own tongues, that the numerals of Californian decimal systems are always irresolvable radicals. There are enough other mathematical processes besides the quinary used by the California Indians to make it possible for many of the numerals below ten to be derivative words with ascertainable meaning. Even where no mathematical process is employed, the numerals may be descriptive of some circumstance attending the habitual method of counting. Thus in Yurok seven, which would fall on the index finger as the Indians count on their fingers, is derived from the verbal root denoting pointing, which gives name to the index finger; and eight from the word long, from which the middle finger is named.

As in the case of the quinary system, the decimal method must be separately considered below ten, from ten to twenty, and above twenty. A few Californian languages show a decimal system throughout, even to being based on hundreds from one hundred up; but not infrequently an otherwise decimal system is quinary below ten. Sometimes a decimal system changes above twenty to a vigesimal one, for which an analogy is not far distant in French. That a system whose numerals to ten are purely decimal — unanalyzable — should from ten to twenty follow the quinary method, seems almost incredible; yet such is the case in certain Miwok or Moquelumnan dialects, though it is fair to add that the quinary method is so far crystallized in these higher numerals that the etymology of the words can scarcely be evident to the Indians without deliberate reflection.

Vigesimal. — Counting by twenties from twenty to one hundred is rarer in California than counting by tens. Sometimes it appears as a continuation of a quinary method, sometimes it is imposed on a decimal system. It should be noted that the tens between the twenties may be formed by two methods, either by addition to the preceding twenty, or by subtraction from the following one : fifty

being forty-plus-ten or sixty-less-ten. The method by subtraction is confined to a small continuous area, occupied by parts of three different linguistic stocks in the north-central part of the state, North-western Maidu, Southern Wintun, and several Pomo divisions.
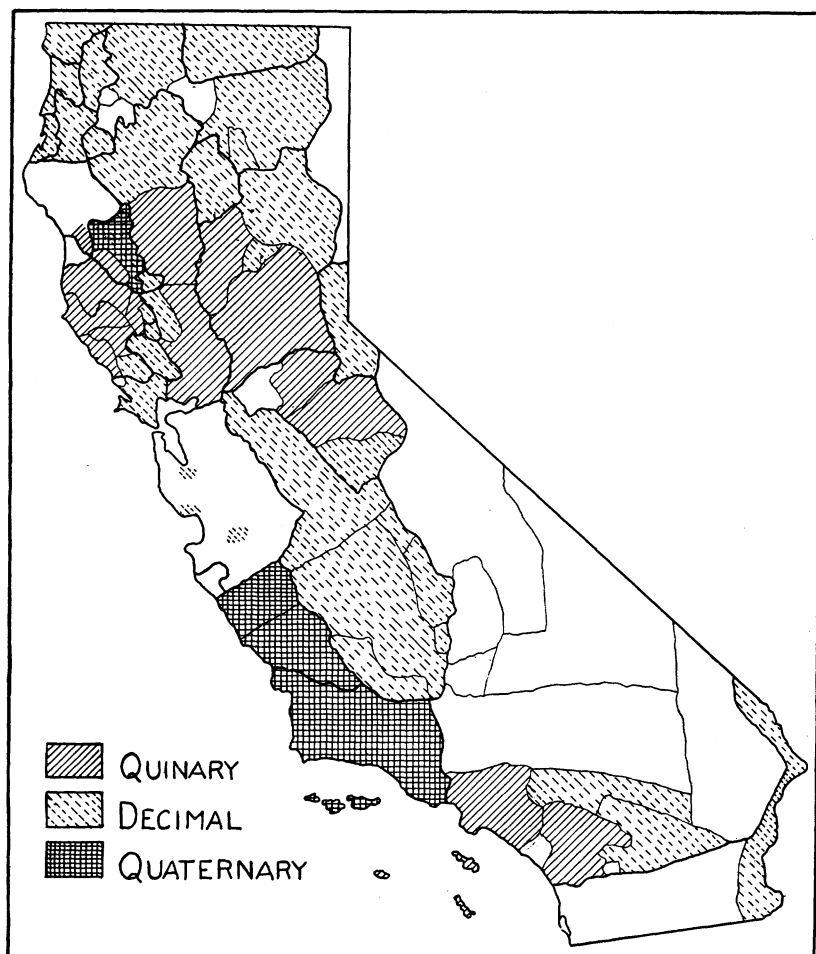

FIG. 41. — Distribution of Methods of Counting from Ten to Twenty in California.

Quaternary. — Counting by fours is a striking feature of Californian languages, which was already commented on by Duflot de Mofras. It is probably not connected to any extent with ritualism,

for while four is the ceremonial number of a great part of the state, the California Indians are distinctly unritualistic. Some trace of this method is found in many of the linguistic families in the state. Often it takes only the form of a derivation of eight from four, which may be regarded as due either to a multiplicative process or a quaternary one. Two groups however show this process in fuller form : Chumash and Salinan, and one dialect of Yuki. The latter is absolutely quaternary, there being no trace of any quinary, decimal, or vigesimal method in any part of the system.

This extreme quaternary system will be found in the table under the heading Yuki proper. The old man from whom the numerals were mainly obtained was asked if he knew how many fingers he had. He answered without hesitation, *hutcamopesul*, ten. He was asked how many fingers and toes he had, and said he did not know. Two pairs of hands were spread on the ground in front of him and he was asked to count the fingers on them. He proceeded to push the fingers aside one by one, grouping them by fours, and pausing after eight and sixteen. One thumb having been overlooked, he made the total *molmihuipoi*, nineteen, and announced that as the result. This incident is told not to show the feeble arithmetical powers of the Yuki, for the old man's error was due no doubt to his being unaccustomed to count other people's fingers, and had he been allowed to operate, as habitually, with sticks, the mistake would probably not have occurred ; but to illustrate how completely this system, many of whose terms do have reference to the fingers, departs from the common primitive quinary-vigesimal finger-and-toe counting method, and is purely quaternary. It does not follow that because people count by their fingers they count by fives.

Multiplication. — The most common form of this method of making numerals is the duplicative. Six is occasionally formed from three, as in Wintun, Yana, and Salinan ; four more frequently from two ; and eight in many cases from four or two. Many families show one of these phenomena in one or more of their dialects. Duplication is not however the only multiplicative method. Threefour for twelve, and three-five for fifteen are found in certain Wintun, Salinan, Chumash, and Shoshonean dialects.

Addition and Subtraction. — In a measure a cross-classification is made by the introduction of these methods (as by that of the multiplicative), since no system can be built up to reach any higher designations without them, and as quinary systems mainly depend
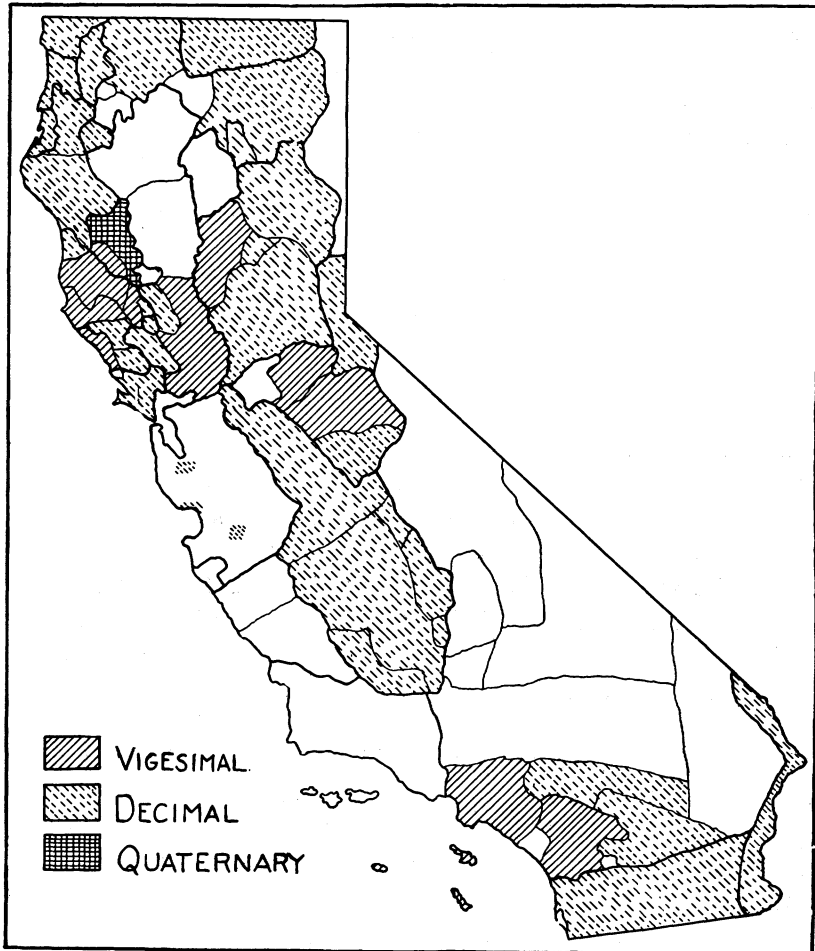
FIG. 42. — Distribution of Methods of Counting from Twenty up in California.

on addition and subtraction for the numbers between six and nine. These methods are mentioned here only to call attention to the fact that both of them occur, subtraction naturally most frequently in the case of nine, fourteen, and nineteen.

Analogy. — A principle which by itself can scarcely be consid-
ered as formative of numeral words, but which undoubtedly influ-
ences them, is that of phonetic analogy.   It is to be expected that
succeeding numerals will be similar in sound even more often among
uncivilized people where consecutive counting is frequent, than un-
der conditions of culture where mathematical operations have largely
supplanted this.   In California phonetic analogy is very frequent.
Both the beginning and end of words exhibit the phenomenon.   In
the great majority of cases the analogy occurs between two and
three, to which circumstance parallels can be found in other Ameri-
can languages, and in fact in those which people of European civili-
zation speak.   Shoshonean, Yurok, Shastan, Chimariko, Pomo,
Wishosk, Washo, Esselen, Wappo Yuki, Athabascan, Yuman, and
Wintun each shows a resemblance between its forms for two and
three.

The nature and causes of the diversity of the numeral systems
are shown plainly in the table of four Yuki dialects.   With one
exception the numerals up to three are sprung from the same radicals
in the several Yuki dialects.   From four on they differ completely
and are all obviously composite.   In many cases the meaning of
the compositions is clear, though their force or origin may not
always be so evident; in other cases it is at least certain that the
words are composite, practically all Yuki radicals being monosyl-
labic.   While one of the four systems is quaternary, two others are
quinary-decimal, and the fourth is quinary-vigesimal.   In addition
to the difference in general method, the actual significance of each
of the numerals, the actions or objects referred to, are almost
invariably different through the four dialects.

It has sometimes been assumed that there exist on the one hand
a quinary-vigesimal method of counting and on the other a decimal
one.   Some authors have not hesitated to class certain languages,
of which only the numerals up to ten were known, as "quinary-
vigesimal," because up to ten they are quinary.   The material
presented in the accompanying tables, as well as the maps, show
that such an assumption cannot be made too cautiously.   Deci-
mal systems change to vigesimal above twenty (Miwok) and to
quinary between ten and twenty (Miwok), and quinary systems fre-

quently are purely decimal from ten up (Shasta, Yana, etc.). In the material here presented there are more cases of a quinary system changing to a decimal or a decimal to a vigesimal, than of a quinary becoming vigesimal or a decimal remaining decimal. To be sure these facts relate only to California, and it can scarcely be doubted that, the world over, for reasons that are obvious, the quinary and vigesimal methods are probably more often associated with each other than with the decimal. But it is clear that such an association must be regarded as at most a general tendency, never as an a priori fact.

The accompanying maps showing the geographical distribution by linguistic families of the various methods of numeral formation, sum up the material collected and the generalizations stated. They are in no need of a commentary beyond a notice of the extent to which the principle of territorial continuity of characteristics obtains. While diversity and irregularity seem the chief features of the maps, yet the areas in which similar numeral methods occur are not randomly scattered, but with few exceptions are geographically continuous. This makes it clear that, with but little borrowing of specific words distinct families have considerably influenced each other as regards their processes of numeral formation.

The numerical systems of North America as a whole may also be briefly referred to. For the numerals below ten, the various linguistic stocks are about evenly divided territorially, roughly half the area of the continent being characterized by the use of the decimal method, and half by the use of the quinary system, although in a number of cases where the decimal system prevails it is not pure, but shows more or less multiplication and subtraction. For numerals above ten, on the other hand, the decimal system, generally pretty pure, occurs in the enormous majority of cases, covering the entire continent with the exception of parts of California and Mexico, the Eskimo area, and the sections occupied by the various members of the Caddoan stock. Only in these few areas does no trace of the decimal system exist above ten. At a number of points on the Northwest coast a quinary system somewhat mixed with decimal occurs.

Mexico is noteworthy for practically not possessing a single native language showing the decimal system either below or above ten.

Consistent or thorough decimal systems, where all the numerals, both below and above ten, are on this basis, cover very large areas, including the regions occupied by the large and important Siouan, Athabascan, Shoshonean, Iroquoian, and Salish stocks. This area is in the main that of the central portion of the continent, and it extends to the Pacific coast in only one or two places.

As contrasted with the wide extension of thorough decimal systems, consistent quinary-vigesimal systems occur but rarely. Outside of Mexico, they are to be found only among the Caddoan tribes, the Eskimo, and in parts of California.

It follows then that the decimal system is, in whole or in part, the predominant system throughout most of North America. The strength of the general tendency toward the decimal basis is shown by the fact that not only do systems which start decimally continue on that basis throughout, but also that those which initially are quinary, in most cases shift above ten to the decimal method. In this connection lies one of the most striking evidences of the variety which obtains in California, for not only do there occur within the area of the state all the general variations in numeral systems which are to be found in the entire remainder of the continent, but there exist also systems found nowhere else in North America, namely those initially decimal but changing in the higher numbers to quinary, and those quaternary throughout.

Altogether it would appear that numerals occupy a very different place in Californian languages from their philological position in Indo-European and other great linguistic families of the old world, and that on the whole they cannot be given the importance in comparison and in questions of determination of genetic relationship, that they occupy in these languages.

	Lutuami[9]	Athabascan[3] Tolowa	Athabascan Hupa	Athabascan Kato
1	nac, nas	La	La	Laxa
2	lap	nax	nax	naka
3	ndan	tak	tak	tak
4	unip	dintce	diñk	naka-naka
5	tunip	cwela	tcwola	lasane
6	nas-ksapt	kostanne	xostan	bûn-Laxa
7	lap-ksapt	tcete	xokit	bûn-naka
8	ndan-ksap	lanisût	kenim	bûn-tak
9	nas-xeks	La-îndui	mûkkostan	bûn-nakanaka
10	te-unip	nestûn	minʟûñ	laʟ-batñ
11	taunep-anta nas[9]	La-tcata	minʟûñ muwa na-La	laʟbatñ-biʟ-Laxa
12	taunep-anta lap	nax-a-tcata	minʟûñ muwa na-nax	laʟbatñ-biʟ-naka
13	etc. regularly to 19	tak-tcata		laʟbatñ-biʟ-tak
14		dintce-tcata		laʟbatñ-biʟ-nakanaka
15		cwela-tcata		laʟbatñ-biʟ-lasane
16		kostanne-tcata		laʟsane-biʟ-Laxa
17		istcete-tcata		laʟsane-biʟ-naka
18		nax duxonni-tcata		laʟsane-biʟ-tak
19		Laundui-tcata	na-dim minʟûñ	laʟsane-biʟ-nakanaka
20	lap-eni taunep[9]	na-de-nestûn	tak-ûtdim-min Lûñ	naka-dûñ-laʟbatñ
21	lap-²ni taunep-anta lap	na-de-nestûn-La-tcata	diñk-itdim-minʟûñ	naka-dûñ-laʟbatñ-biʟ-Laxa
30	nda-ni taunep	tak-nestûn	diñk-itdim-minʟûñ	tak-dûñ-laʟbatñ
40	wunep-ni taunep	dintce-nestûn	tcwola-dim-minʟûñ	nakanaka-dûñ-laʟbatñ
50	etc. regularly to 90	cwela-nestûn	xostûn-dim-minʟûñ	lasane-dûñ-laʟbatñ
60			xokit-dim-minʟûñ	bûnʟa-dûñ-laʟbatñ
70			kenim-dim-minʟûñ	
80			mûkkosta-dim-minʟûñ	
90				
100	taunep-ni taunep	La-atcûn	La-it-dikkin	
200	lap-eni taunep-ni taunep	na-din-La-atcûn	nax-ût-dikkin	

	Karok[1]	Yurok[2]	Wishosk	Chimariko
1	yisa	qoreⁿ	kotser	p'un
2	axak	niiL	riter	xoku
3	kwirak	naxkceiL	riker	xodai
4	pis	tsoneL	riaower	kuigu
5	trop	merotsameL, meru	wesak-elel	tsanehe
6	kirivkir	qoxtseu	tekleluk-elel	p'un-tcibum
7	axak-anivkir	tserucek	haLow-elel	xoku-cbum
8	kwirak-anivkir	knewetek	hiowitaw-elel	xodai-tcibum
9	trop-atitcram	qrerermeq	mercerokw-elel	p'un-tcigu
10	traihar	werLerweriL	rulok-heler	saan-p'un
11	traihar karu yisa	werLerwi nemi qo	me-kotser	p'un-rasut
12	traihar karu axak	werLerwi nemi naain	me-riter	xoko-risut
13	traihar karu kwirak	werLerwi nemi naxkceiL		xodai-risut
14	traihar karu pis	werLerwi nemi tsoneL		kuigu-rsut
15	traihar karu trop	meru nemi tsam		tsanhe-risut
16	traihar haru kirivkir	qoxtseu nemi tsam		p'untcibum-arsut
17	traihar karu axakanivkir	tserucek nemi tsam		xokocbum-arsut
18	traihar karu kwirakanivkir	knewetek nemi tsam		xodaicibum-arsut
19	traihar karu tropatitcram	qrerermeq nemi tsam		p'untcigu-rsut
20	axak-a-traihar	nemi-werL	ritava-helel	xoku-mtun saanp'un
21	axak-a traihar karu yisa	nemi-werL nemit qoor		
30	kwirak-a-traihar	naxkeemi-werL	hikwa-helel	xoda-mtun saanp'un
40	pis-a-traihar	tsonemi-werL	rama-helel	kuigu-mtun saanp'un
50	trop-a-traihar	merutsi-werL	wesohele-weler	tsanehe-mtun saanp'un
60	kirivkir-a-traihar	qoxtseutsi-werL	teklelukhele-weler	
70	axakanivkir-a-traihar	tserucektsi-werL	haluhele-weler	
80	kwirakanivkir-a-traihar	knewetektsi-werL	hiowitahele-weler	
90	tropatitcram-a-traihar	qrerermeqtsi-werL	mercerokwhele-weler	
100	yisa patcis	werLerwitsi-werL	kotses-wani-heler	bucua-p'un
200	axak patcis			bucua-n-xoku

	Wintun[6] Southern, Cache Creek	Wintun Southern	Wintun Central	Wintun Northern
1	ete-ta	ete-ta	ketet	ketem
2	pampu-ta	pampa-ta	palel	palet
3	punul-ta	punuL-ta	panoL	panoL
4	emus-ta	emus-ta	Lawit	Lawi
5	ete-sem-ta	ete-sem-ta	tcancem	tsansem
6	ser-pul-ta	sere-puL-ta	se-panoL	sere-panoL
7	serp-uteta	serp-ete-ta	tcumiL	loloqi
8	pan-emus-ta	pan-emux-ta	tse-Lawit	se-Lawi
9	pan-emus-teta	panem-ete-ta	cema-ketet [*sic*]	ketem-ilis
10	pampa-sem-ta	pampa-sem-ta	cema	tiqelis
11	papu-sem-eteta	lum-eteta	cema-palel [*sic*]	tiqelis ketem-Lomi
12	panL-omi	panL-omi	= 3 [*sic*]	tiqelis pa-Lomi
13	panpu-sem-punulta	panLomi-tela	= 4 [*sic*]	tiqelis pano-Lomi
14	panpu-sem-emus-ta	Loti	= 5 [*sic*]	tiqelis Lawi-Lomi
15	panpu-sem-ete-sem-ta	punu-semta	panoL-tcancem	tiqelis tsane-Lomi
16	etc. to 19	pos-eteta	atc-ketet	tiqelis sere-pano-Lomi
17		pos-e-pano	= 2	tiqelis loloqi-Lomi
18		pan-ueli	= 3	tiqelis se-Lawi-Lomi
19		yaig-ueli	= 4	tiqelis ketem-ilis-Lomi
20		ete-kai	ketet-tcak	kete wintun
21		etekai-La-etela		kete wintun ketem-Lomi
30	punL-ada	ponL-ara-xsla	= 5 [*sic*]	panoL tiqelis
40	emus-pampusemta	pampa-kai		pal wintun
50	etesem-pampusemta	Lematin-posLai		tsanse tiqelis
60	serpul-pampusemta	pos-Lai		panol wintun
70	serpute-pampusemta	Lematin-emukai		
80	panemus-pampusemta	emu-kai		
90	panamusteta-pampusemta	Lematin-etesemkai		
100		etesemkai		kete semhanot
200				pal semhanot

	Pomo[5] Northern	Pomo Central	Pomo Eastern	Pomo Southwestern	Pomo Southern	Pomo Southeastern	Pomo Northeastern
1	tca	tato	kali	ku	t'ca	dan	tcaki
2	ko	ko	xotc	ko	ako	xos	kon
3	subu	sibo	xomka	sibo	misibo	xoxat	kutc'aka
4	tak	duo-ko	dol	mitca	mi'tca	dako	kalkoton
5	cal	natsui	lema	tuco	tuco	talko	tc'a-ucon
6	tsadi	tsadi	tsadi	tsadi	lan-tca	xowaloxat	tca deika
7	koba	koina	kula-xotc	lan'-tca	lat-ko	sebaita, serpateta	tcumalan
8	koko-dol	koko-dol	koka-dol	lan'-ko	komtca	panamusta, dan-widi	ceLawi-tca
9	kowal-com	namilka-com	hadagal-com	komtca	tcatco	xut-pacem	na'kata
10	kowal-tek	namilka-tek	hadagal-tek	tcatco	tca-cuto	pacem	ceLawi-tcaki
11	kowal-na-tca	namilka-na-tato	hadagal-na-kali	tca-coto	nan-tca	pacem-ke-dan	kat-tcaki
12	kowal-na-ko	namilka-na-ko	hadagal-na-xotc	nan-tca	nañ-ko	pacem-ke-xos	kat-kokai
13	kowal-na-subu	namilka-na-sibo	hadagal-na-xomka	na-ko	nan-sibo	pacem-ke-xoxat	kat-kutcaka
14	komat-com	komat-com	xomka-mar-com	na-sibo	si-hma-con	pacem-ke-dako	kat kalkoto
15	komat-tek	komat-tek	xomka-mar-tek	si-hma-con	si-hma-tik	pacem-ke-talko	
16	komat-na-tca	komat-na-tat	xomka-mar-na-kali	si-hma-tek	si-hma-nan-tca	pacem-ke-xowaloxat	
17	komat-na-ko	komat-na-ko	xomka-mar-na-xotc	si-hma-nan-tca	si-hma-nañ-ko	pacem-ke-sebaita	
18	komat-na-subu	komat-na-sibo	xomka-mar-na-xomka	si-hma-na-ko	si-hma-nan-sibo	pacem-ke-panamusta	
19	tca-hma-com	tca-hma-com	xai-di-lema-com	si-hma-na-sibo	tca-ham-con	pacem-ke-xutpacem	
20	tca-hma-tek	tca-hma-tek	xai-di-lema-tek	tca-hma-con	tca-hma-tik	ete-kai	
21	tca-hma-na-tca	tca-hma-na-tat	xai-di-lema-na-kali	tca-hma	tch-hma-non-tca	ete-kai-ke-dan	
30	na-na-kowal-tek	na-namilka-tek	na-hadagal	tca-hma-nan-tca	lantca-hma	xoxolo-mai	
40	ko-te	ko-te	xotsa-xai	lantca-hma	tca-hai	dan axots	
50	kowali-subu-te	namilka-wi-sibo-te	hadagal-e-xomka-xai	ku-hai	tuco-hai	talko-tal-pacem	
60	subu-te	sibo-te	xomka-xai	coto-hma	lantca-cuto	xowalka-tal-pacem	
70	na-kowali-ta-te	namilka-wi-duoko-hai	hadagal-ai-dola-xai	si-hmak-tcidu	latko-cuto	caba-tal-pacem	
80	ta-te, tak-hai	duoko-hai	dol-a-xai	si-hmak-tcidu-tcacoto	komtca-cuto	dan-wi-tal-pacem	
90	na-kowali-cal-hai	namilka-wi-natsui-hai	hadagal-ai-lema-xai	ko-hai	tcatco-cuto	xut-pacem-tal-pacem	
100	cal-te, cal-hai	natsui-hai-tek	lema-xai	ko-hai-tcacoto-ko	tcacuto-hai		
200	kowal-hai	namilka-tek-hai	hadagal-a-xai	ko-hai-tcahma-ko	ako-hai		

	Yuki *Round Valley*	*Yuki* *Coast*	*Yuki* *Huchnom*	*Yuki* *Wappo*	*Washo*
1	paⁿ-wi	pow-ik	pu-we	pawe	lak'a
2	op-i	op-ik	op-e	hopi	heske-ñ
3	molm-i	molm-ik	molm-e	hoboka	helmi-ñ
4	o-mahaⁿt, op-mahaⁿt	hilkil-opik	kes-ope	ola	hawa
5	hui-ko	pou-pat	pu-putc	gada	tubaldi-ñ
6	mikas-tcil-ki	pou-tit	pu-tal	pa-tenauk	tubaldi-lak
7	mikas-ko	ope-tot	opi-nun	hopi-tenauk	tubaldi-heskeñ
8	paum-pat, mipat-al-a-wa	molme-tit	kina-sa-nun	hopi-han	hawaawa
9	hutcam-paⁿwi-pan	hilkil ope-tit	helpiso-pu-tal	paw-alak	tubaldi ida hawa
10	hutcam-opi-sul	popate-tit	helpiso-humate	mahaic	laka mutsumi
11	molmi-sul		helpiso-pu-tik	mahaic-bawa-len	laka mutsumi ida lak
12	omahaⁿt-sul		helpiso-ope-tik	mahaic-hopi-len	laka mutsumi ida heske-ñ
13	huiko-sul		helpiso-molme-tik		
14	mikastcilki-sul		a'la-pu-tan	mahaic-ola-len	
15	mikasko-sul		a'lau'		
16	hui-co(t), or 'eight'		a'la-pu-tik	mahaic-patenauk-len	
17	paⁿwi-hui-luk, or 'nine'		a'la'-ope-tik		
18	opi-hui-luk, or 'ten'		a'la-kinasanun-tik		
19	molmi-hui poi, or 'eleven'		pu-al-yak pu-tan	mahaic-paalak-len	
20	omahaⁿt-hui-poi, or 'twelve'	op-keckeneclak	pu-al-yak	hopi-hol	
21				hopi-hol paa-len	
30		mol-keckeneclak	misau op'-alya	boko-hol	heske mutsumi
40		hilkilop keckeneclak	op'-alya	ol-hol	helmi mutsumi
50		poupat-keckeneclak	misau mom-alya	gada-hol	
60			mom-alya	patenauk-hol	
70			misau kinasanun-alya	hopitenauk-hol	
80			kinasanun-alya	hopihan-hol	
90				paalak-hol	
100	po-al		pu-al	mahaic-hol	
200	ope-al		ope-al		la'mutsummutsumi

	Shastan Achomawi	Shastan Atsugewi	Shastan [30] Shasta	Yana [8]
1	hamis	tsutsatstsi	ts'amo	pai-ku
2	haq	hoki	xokwa	o'-mitci
3	tsasdi	kiski	xatski	pul-mitci
4	hadama	haq'-kau	irahaya, idahaya	tau-mi
5	latu	harapakina	e'-tsa	tciim-an, tcimani
6	mas-uts	tciu-put-saki	tso-wateha	pur-han, bun-hari[8]
7	haq-uts	hoki-put-saki	xokwa-wateha	tcumini
8	hadame-lilh	kiski-put-saki	xatski-wateha	taum-hari, u'tesa[8]
9	malusi-dudjiku hamis-antji	tciwi-rap-saki	irahaya-wateha	pai-itca-tenna, pai-itca[9]
10	malusi	tcuw-iksii	e'tse-hewi	hats-er'j, hats-an
11	malusi hamis-atumi	tcuwiksii tciu-i wawi	e'tsehewi-tok tsea keheha	pai-mamii, pai-iwa
12	malusi ede-haq-atumi	hoki-i wawi	e'tsehewi-tok xokwa keheha	o'-mamii, owh-iwa
13	malusi ede-tsasd-atumi	kiski-i wawi	etc. regularly to 19	pul-mamii, pul-iwa
14	malusi ede-hadam-atumi	haqau-i wawi		taumi-mamii, taum-iwa
15	malusi ede-lad-atumi	harapakina-i wawi		tciman-mamii, tciman-iwa
16	malusi ede-masuts-atumi	tciriputsaki-i wawi		purha-mamii
17	malusi ede-haquts-atumi	hokiputsaki-i wawi		tcumini-mamii
18	malusi ede-hadamelil-atumi	kiskiputsaki-i wawi		taumhari-mamii
19		tciwirapsaki-i wawi		paitcatunna-mamii
20	haq-el-malusi, masis	hok'-ne tcuwiksii	xokwa-id e'tsehewi	uciwaii
21	haq-el-malusi hamis-atumi	hok'-ne tcuwiksii tciw-i wawi		uciwaii hatsermamii
30	tsasd-il malusi	kiks-ne tcuwiksii	xatski-dai e'tsehewi	
40	hatam-il malusi		irahaya-idu e'tsehewi	
50	lat-il malusi		e'ts-idu e'tsehewi	
60	masutj-il malusi		tsuwad-iru e'tsehewi	
70	masuts-wade hamisatumi malusi		xokwawad-idu e'tsehewi	
80	masuts-haq-ilatumi malusi		xatskiwad-iru e'tsehewi	
90			irahayawad-idu e'tsehewi	
100	malus-el malusi		e'ts-idu-wad-idu e'tsehewi	
200				

	Maidu Northwestern[18] — Konkau	Maidu Northwestern[18] — Mooretown	Maidu Northeastern — Genesee	Maidu Southern[18] — Spanish Flat[13]
1	wikte	wikte	suti	wite
2	pene	pene	pene	pen
3	sapu	sapwi	sapu	sapwi
4	tsōye	tsōye	tsōye	tsōye
5	ma-tsani[14]	ma-wika[15]	ma-wika	ma-wik
6	sai-tsoko	sai-tsoko	sai-tsoko	tombo
7	matsan-pene	topwi	topwi	topwi
8	tsōye-tsoko	pen-tcoi	pen-tcōi	pen-tcōi
9	tsōye-ni-masoko[10]	peliom	peliom	pen-lio
10	ma-tsoko	ma-tsoko	ma-tsoko	ma-tsani[14]
11	wikem-noko[11][12]	wikte-ni wikem-noko[11]	masok-na sutim[16]	hi-woto
12	peni-wikem-noko	wōkem-noko	wōkem-noko[11]	pen-woto
13	sapwi-ni-hiwali[10]	sapwim botam	masok-na sapwi[10]	sapwi-ni-al
14	tsōye-ni-hiwali	tsōyem botam	masok-na tsōyem	tsōi-ni-al
15	hiwali	matsokom mawikom	masok-na mawikem	hiwal
16	wōk-ni-maiduk-wōkō[10]	matsokom saitsokom		oiseto
17	peni-maiduk-wōkō	etc.		penem maiduk
18	sapwi-ni-maiduk-wōkō			sapwi-nim maiduk
19	tsōye-ni-maiduk-wōkō			tsōi-nim maiduk
20	maidu-k-wōkō	penim nokom	penem masoko	kom maiduk[17]
21				
30	matsok-ni pene-ma	sapwim matsoko etc., regularly	sapwim masoko etc., regularly	sapwim matsan
40	peni-ma			tsōim matsan
50	matsok-ni sapwi-ma			
60	sapwi-ma			
70	matsok-ni tsōye-ma			
80	tsōye-ma			
90	matsok-ni matseni-ma			
100	matseni-ma			
200				

	Moquelumnan Plains	Moquelumnan Amador	Moquelumnan Tuolumne	Moquelumnan Mariposa	Moquelumnan Coast—Western and Southern	Moquelumnan Coast—Northern
1	kenatii	luti	keñe	keñe	kene	kene
2	oyoko	otiko	otiko	otiko	osa	ota
3	teloko	tolokocu	tolokocu	tolokot	teleka	teleka
4	oiceko	oyisa	oyisa	oyisa	huya	otota
5	kacoko	macoka	macoka	mahoka	kenekus	kedeko
6	temepu	temoka	temoka	temoka	patcitak	patsadat
7	kenekak	kenekaku	kenekaku	titawa	semlawi[20]	semlawi
8	kawinta	kawinta	kawinta	kawinta	osuya	otaya
9	woe	wo'e	woe	eliwa	unutas	kenen-helak
10	ekuke	naatca	naatca	naatca	kitsis	ukukutsi
11		lu-cakena	keñ-hateaku	naatca keñe hateuni	kene-lilek	kene-walik
12		otik-cakena	otik-sakenu	naatca otiko-i hateuni	osa-lilek	ota-walik
13		toloti-aku	tolok-sakenu	naatca tolokot-ui hateuni	etc. regularly	etc. regularly
14		kolok-aku	kolok-aku	naatca oyisa hateuni		
15		yuali	yuali	naatca mahoka hateuni		
16		oy-ota	oyoto	etc. to 19		patsada-ko-walik
17		otiko-maiazo	naatca mu kenekaku			
18		tak-cakena	naatca mu kawinta			
19		minimi	naatca mu woe			kenenhela-ko-walik
20		naa	naa	oti-ak naatca	osa-gitcis	ota-tumai
21		naa-ima luti	naa mu keñe	oti-ak naatca keñe hateuni	osa-gitcis-kene	ota-tumai-to-kene
30		naa tomeakii naatcai[19]	naa mu naatca	tolo-yak naatca	teleka-gitcis	teleka-tomai
40		otik-mama[19]	otik-mumu	oyis-iak naatca	huya-gitcis	etc. regularly
50		otikmama tomeakii naatcai	otik-mumu naatca heyi	maho-yak naatca	keneku-gitcis	
60		tolok-momo[19]	tolok-mumu	temo-yak naatca	etc. regularly	
70		tolokmomo tomeakii naatcai	tolok-mumu naatca heyi	titawa-yak naatca		
80		oyis-momo	oyis-mumu	kawita-yak naatca		
90		oyis-momo tomeakii naatcai	oyis-mumu naatca heyi	eliw-iak naatca		
100		macok-mumu[19]	macok-mumu	keñe nenu, naatc-iak naatca	gitcis gitcis	ukukutsi-tomai
200						

	Yokuts Valley	Yokuts Foothills	Yokuts Kern Lake	Shoshonean Gabrielino	Shoshonean Cahuilla	Shoshonean Serrano
1	yet	yet	yit	puku	supli	haukup
2	ponoi	poñoi	puñi	wehe	wi	wor
3	copin	copin	cop	pahe	pa	pahi
4	hotponoi	hatpañi	tapañi	watsa	witcuw	watca
5	yitcinil	yǎtciñud	yitsǎñul	mahar	nama-qwan-añ	maha'tc
6	tc'olipi	tc'odipi	ts'olipi	pabahe	qwan-supli	paⱬahai
7	nomtc'il	nomtc'in	numts'in	watsa kaⱬia	qon-wi	watc'-kuⱬik
8	mun'oc	mun'oc	mu'nas	wehe-s watsa	qon-pa	wa'-wutc
9	coponhot	nonip	wutcat	mahar kaⱬia	qon-witcuw	ma'-kuⱬik
10	t·ieu	t·ieu	t·ieu	wehe-s mahar	nami-tcumi	wor-maha'tc
11	yetc-am	yetc-am	dǒwap	wehe-s mahar koi puku	peta-supli	pu'pa-haukup
12	patcd-om	cuyukai	culokai	wehe-s mahar koi wehe	peta-wi	pu'pa-wor
13	copi-om	copi-om	t·ieu ya cop[21]		peta-pa	pu'pa-pahi
14	hotcp-om	hatcp-am	t·ieu ya tapañi		peta-witcuw	pu'pa-watca
15	yitc-am	yǎtc-am	t·ieu ya yitsǎñul		peta-namaqwanañ	pu'pa-maha'tc
16	tc'olp-om	tc'oap-om	t·ieu ya ts'olipi		peta-qwansupli	
17	nomtc'-om	nomtc'-om	t·ieu ya numts'in		peta-qonwi	
18	mun'c-am	mun'c-am	t·ieu ya mu'nas		peta-qonpa	
19	coponhot-min	nonp-om	t·ieu ya wutcat		peta-qonwitcuw	
20	ponoi t·ieu	poñoi t·ieu	puñi t·ieu	wehe-s wehe-s mahar	wis namitcumi	woho-wormaha'tc
21		poñoi t·ieu yet			wis namitcumi petasupli	
30	copin t·ieu	copin t·ieu	cop t·ieu	pahe-s wehe-s mahar	pas namitcumi	pohi-wormaha'tc
40	hotponoi t·ieu	hatpañi t·ieu	tapañi t·ieu	watsa-hes wehe-s mahar	witcius namitcumi	watca-wormaha'tc
50	yitcinil t·ieu	yǎtciñud t·ieu	yitsǎñul t·ieu	mahar-es wehe-s mahar	namaqwanañes namitcumi	
60	etc.	etc.	etc.		qwansuplis namitcumi	
70					qonwis namitcumi	
80					qonpas namitcumi	
90					qonwitcius namitcumi	
100	yet pitc	yet pitc	yit demenitc	wehe-s mahar-es wehe-s mahar	supli pisetiwenit	
200	ponoi pitc	poñoi pitc				

	Chumash San Luis Obispo	Chumash Santa Cruz Island	Chumash Santa Barbara	Chumash Santa Ynez
1	tsxumu [23]	ismala	paka [24]	paka [24]
2	ecin	isxum	ickomo	ickom
3	mica	masex	masex	masöx
4	paksi [23]	ckumu	ckumu	ckumu
5	tiyewi	sit-isma	yiti-paka	yiti-pakas
6	ksua-sya	sit-isxum	yiti-ckomo	yiti-ckom
7	kcua-mice	sit-masex	yiti-masex	yiti-masöx
8	ckomo [23]	malawa	malawa	malawa
9	cumo-tcimaxe	spa	tspa	ts'pa
10	tuyimili	ka-ckum	kel-ckomo	tciya
11	tiwapa	telu	tulu	na-paka [25]
12	takotia	masex-pa-ckumu	masex-eskumu	na-ickom
13	wak-cumu		kel-paka	na-masöx
14	wakl-esin		kel-icko	na-ckumu
15	wakl-mice		kel-masex	na-yitipakas
16	peusi		peta	na-yitickom
17				etc.
18				
19				
20		isxum-pas-kackum [25]	ickom-c-kelckomo [25]	ickom-a-tciya [25]
21				
30		masex-e-pas-kackum	mase-c-kelckomo	masöx-a-tciya
40		ckumu-pas-kackum	cumu-c-kelckomo	ckumu-a-tciya
50			yitipake-c-kelckomo	yitipakas-a-tciya
60				etc.
70				
80				
90				
100				
200		kackum-pas-kackum		

	Costanoan San Juan Bautista	Costanoan Monterey	Costanoan Santa Cruz	Costanoan Santa Clara	Esselen	Salinan[28] San Antonio	Yuman[29] Mohave
1	hem-etca	im-xala	im-hetc	im-hen	pek	ki-tol	seto
2	utsxin	ut'is	ut'in	utin	xulax	kakice	haʋik
3	kapxan	kapes	kaphan	kapan	xulep	Lapai	kamok
4	utit, karuac	ut'itim	katuac	katuac	xamaxus	ki-ca	tcimbapk
5	parue	hale-is	micur	mucur	pe-maxala	ult·ao	çarapk
6	na-kitci	hale-caken	caken	caken	pek-walanai	pai-nel	siinta, maisentik
7	tsa-kitci	ut-xomai-caken	tupuituk	kenetc[26]	xulax-walanai	te	ʋiika, maikoʋiika
8	taitimin	kap-xai-cak	usatis	osatis	xulep-walanai	ca-nel	muuka, maikomuuka
9	paki	pak	neuku	telektic[27]	xamax-walanai teta-tsoi		payi, paya
10	tansa-xte	tantsa	iec	wec	tomoila	tsoe	arrapa, raphaʋik
11	tansa-xte hemetca hatcitcos		imhec-waka-uc	inhen-ay	pek-kelenai	tso-sok-tol	raphaʋik asenkenik
12			ut'in-uc	utin-ay	xulax-kelenai	Lapai-kca	raphaʋik haʋik niðauk
13						Lapaikca·t·ek-tol	raphaʋik hamok niðauk
14						wococo	etc.
15						Lapai-ult·ao	
16						kpec	
17							
18							
19							
20	utsxin-tanats		ut'in-iwec	utin-wic			(raphaʋik) dakaðutcʋe haʋik
21							
30	utit-tanats		kaphan-iwec	kapan-wic			(raphaʋik) dakaðutcʋe hamok
40			katuac-iwec				(raphaʋik) dakaðutcʋe tcimbapk
50			micur-iwec				(raphaʋik) dakaðutcʋe çarapk
60			caken-iwec				
70							
80							
90							
100	tansa-xte tanat		tapan				(raphaʋik) dakaðutcʋe raphaʋik
200							

NOTES TO THE LISTS OF NUMERALS

(1) Thanks are due the following for contributions to these lists: Professor P. E. Goddard, the Athabascan tables; Mr S. A. Barrett, all the Pomo, the Central and Cache Creek Wintun, the Coast and Tuolumne Moquelumnan, and Wappo Yuki; Dr A. M. Tozzer, part of the Amador Moquelumnan; Mr H. B. Wilson, part of the Southern Wintun. The Lutuami is taken from A. S. Gatschet's work on the Klamath language. Hale, in volume II of *Transactions of the American Ethnological Society*, has furnished San Antonio Salinan, San Luis Obispo Chumash, and, with Loew (Appendix to volume VII of the *Wheeler Survey*), the Santa Barbara Chumash. The Gabrielino list is mainly from Ried's account of the Los Angeles Indians, reprinted by Taylor in the *California Farmer*. The following are from the various sources drawn upon in the linguistic appendix of Powers' *Tribes of California*: Wishosk (part), Costanoan except Monterey, Santa Cruz Island Chumash. Esselen is from a compilation in a paper in volume II of the *University of California Publications in American Archæology and Ethnology*.

(2) The normal Athabascan numeral system is decimal. Hupa 11 is translated by Professor Goddard 10 by-its-side again-1. Kato, the southernmost dialect in the state, in territorial contact with Yuki and Pomo, is quinary as far as 20.

(3) The Yurok numerals show many forms according as they refer to different classes of objects. The forms here given are used in counting. From 6 to 9 the ending -*tsameʟ*, found also in 5, may be added. The words for 7, 8, and 9 are the names of the three middle fingers of the hand. *Tserucek*, 7, means pointer, the index finger, from *tserwerc*, to point; *knewetek*, 8, means long one, the middle finger. From 11 to 14, *werʟerwi*, 10, may be omitted.

(4) The interesting Yuki numerals are given in translation in the accompanying table. In the Round Valley or Yuki proper dialect, which alone is quaternary, but is strictly so, a number of variant forms have been obtained. 8 may be *mipat-op-kitc*; 9, *hutcam-pan*, or *paⁿwi-pan*, both reductions of the full form *hutcam-paⁿwi-pan*; 10, likewise by omitting hutcam, *opi-sul*; 18, *opi-hui-poi*. 24 = 8, 26 = 10, 35 = 19, 51 = 19, 64 is *omahaⁿt-tc-am-op*. The elements entering into the higher compound descriptive numerals appear, from comparison with other Yuki words and phrases, to have the following meanings: *sul*, body (Indian's translation, hang); *luk*, project (Indian's translation, in); *coi*, stuff (Indian's translation, in); *al-a-wa*, stick-wide, with inserted phonetic -*a*-; *kitc*, cut; *poi*, in; *pat*, flat; *pan*, hang; *pa*, lift; *hutcam*, Indian's translation, over, beyond; *mikas*, Indian's translation, even. It will be seen that none of the dialects, except Wappo, shows simple stems, that is, pure numeral roots, above 3; and that the stems for 1 and 2, *paw* and *op*, are the only words common to the counting of the four dialects.

ANALYSIS OF YUKI NUMERALS

	Yuki proper	*Coast*	*Huchnom*	*Wappo*
1	1	1	1	1
2	2	2	2	2
3	3	3	3	hoboka
4	2-forks	hilkil-2	kes-2	ola
5	middle-in	1-flat (?)	1-putc	gada
6	mikas-tcilki	1-tit	1-tal	1-tenauk
7	mikas-in	2-tit	2-nun	2-tenauk
8	1-flat, hand-stick-flat, hand-on-cut	3-tit	kinasa-nun	3-han
9	beyond-1-hang, beyond-hang, 1-hang	4-tit	helpiso-1-tal	1-put-out (?), 1-stick-ak(?)
10	beyond-2-body, 2-body	5-tit	helpiso-straight	mahaic
11	3-body		helpiso-1-tik	mahaic-1-and
12	2-forks-body·		helpiso-2-tik	mahaic-2-and
13	middle-in-body		helpiso-3-tik	
14	mikas-tcilki-body		stick(?)-1-tan	mahaic-4-and
15	mikas-in-body		stick(?)	
16	middle-none, 8		stick(?)-1-tik	mahaic-6-and
17	1-middle-project, 9		stick(?)-2-tik	
18	2-middle-project, 10		stick(?)-8-tik	
19	3-middle-project, 11		1-stick-stand-1-tan	mahaic-9-and
20	4-middle-project, 12	2-keckeneclak	1-stick-stand	2-hol
30		3-keckeneclak	finger-2-stick-stand	3-hol
40		4-keckeneclak	2-stick-stand	4-hol
50		5-keckeneclak	finger-3-stick-stand	5-hol
60			3-stick-stand	6-hol
64	2-fork-pile(?)-at			[6-hol-4-and]
100		1-stick	1-stick	10-hol
200		2-stick	2-stick	

Yuki proper 8, hand-on-cut, may also be translated hand-2-cut, or hand-2-only.

(5) The composition of the Pomo numerals in the several dialects is shown in the following table. Italicized words are connotive, not etymological translations. They give the meaning which the Indian part of the word must have, as shown by the remainder of the word. It will be seen that all the systems are entirely quinary-vigesimal, except the South-eastern, which while decimal above ten is largely borrowed from the neighboring Wintun, and the Southern dialect, which is decimal from forty up. There is some subdialectic difference within this latter dialect. A southern subdialect differs from that given here in being decimal between ten and thirty. The numbers from eleven to nineteen are formed from *wi*, a conjunction, and the numbers from one to nine. Twenty in this southern subdialect is two ten. In the Northern, Central, and Eastern dialects the word for ten may be omitted in the numbers from eleven up, though this is unusual. The same holds true in the Southeastern dialect. In the Southern and Southwestern dialects, on

the other hand, the numbers from eleven to thirteen are usually spoken simply and one, and two, and three, without prefixed ten, although this ten is occasionally used.

ANALYSIS OF POMO NUMERALS

	Northern	*Central*	*Eastern*	*Southwestern*	*Southern*	*Southeastern*
1	1	1	1	1	1	1
2	2	2	2	2	2	2
3	3	3	3	3	3	3
4	4	duo-2	4	4	4	4
5	5	5	5	5	5	5
6	1-di	1-di	1-di	lan-1	lan-1	6
7	2-ba	2-ina	kula-2	lan-2	lat-2	7 [Wintun]
8	2-ko-4	2-ko-4	2-ka-4	kom-4 (?)	kom-4 (?)	1-widi, or
						8 [Wintun]
9	10-*less*	10-*less*	10-*less*	1-tco	1-tco	xut-*10*
10	10-*full*	10-*full*	10-*full*	1-10	1-10	*10* [Wintun]
11	10- + -1	10- + -1	10- + -1	+ -1	+ -1	*10*- + -1
12	10- + -2	10- + -2	10- + -2	+ -2	+ -2	*10*- + -2
13	10- + -3	10- + -3	10- + -3	+ -3	+ -3	*10*- + -3
14	15-*less*	15-*less*	3-mar-*less*	3-hma-*less*	3-hma-*less*	*10*- + -4
15	15-*full*	15-*full*	3-mar-*full*	3-hma-*full*	3-hma-*full*	*10*- + -5
16	15- + -1	15- + -1	3-mar- + -1	3-hma- + -1	3-hma- + -1	*10*- + -6
17	15- + -2	15- + -2	3-mar- + -2	3-hma- + -2	3-hma- + -2	*10*- + -7
18	15- + -3	15- + -3	3-mar- + -3	3-hma- + -3	3-hma- + -3	*10*- + -*8*
19	1-hma-*less*	1-hma-*less*	stick-di-5-*less*	4-hma-*less*	4-hma-*less*	*10*- + -9
20	1-hma-*full*	1-hma-*full*	stick-di-5-*full*	4-hma-*full*	4-hma-*full*	*1*-stick
						[*1*=Wintun]
21	1-hma-	1-hma- + -1	stick-di-5-*full*-	4-hma- + -1	4-hma- + -1	*1*-stick- + -1
	+ -1		+ -1			
30	na-na-10-	na-10-*full*	na-10	6-hma	6-hma	6-mai
	full					
40	2-stick	2-stick	2-stick	1-stick	1-stick	1-axots
					(4-stick?)	
50	10-i-3-stick	10-at-3-stick	10-e-3-stick	10-hma	5-stick	5-tal-*10*
60	3-stick	3-stick-*full*	3-stick	3-hma-tcidu	6-10	6-tal-*10*
70	na-10-4-	10-at-4-stick	10-ai-4-stick	3-hma-tcidu-	7-10	7-tal-*10*
	stick			10		
80	4-stick	4-stick	4-stick	2-stick	8-10	8-tal-*10*
90	1-10-5-stick	10-at-5-stick	10-ai-5-stick	2-stick-10-ko	9-10	9-tal-*10*
100	5-stick	5-stick-*full*	5-stick	2-stick-1-	10-stick	
				hma-ko		
200	10-stick	10-*full*-stick	10-stick		2-stick	

(6) Northern Wintun 6 and 8 are derived from 3 and 4 by the prefixion of multiplicative *sere-* or *se-*. 20 is 1 person. 40 and 60 are respectively 2 and 3 persons, but 30 and 50 are 3–10 and 5–10. The method of counting above 20 is thus alternately vigesimal and decimal.

Multiplication is also found in Central Wintun *panoL-tcancem*, 15, = 3–5, and in Southern *panLomi*, 12, which appears to be *panoL-Lawi*, 3–4. The Southern dialect is vigesimal from 20 up, except for *ponL-araxsla* thirty; *ponL*, = *panoL*, 3, shows this to be a decimal form.

(7) Achomawi 70 and 80 are not decimal, but formed from 60 as a base.

(8) Yana *bun-hari* and *taum-hari*, 6 and 8, are from *pul-mitci* and *taumi*, 3 and 4.   9 contains the stem of 1.

(9) Lutuami -*anta*, on 11–19, is a locative case ending; -*ni*, on 20–90, is a suffix making adjectives of numerals.

(10) The frequent -*ni*, 'with,' in the Maidu lists is to be taken as equivalent to 'toward,' counting from the last preceding basis.   1-with-man = 1 toward a man = 1 toward 20, i. e. 1 toward 20 from 15, the last basis.   Somewhat analogously, the suffix -*na*, 'from,' is in the Northeastern dialect used in a sense the opposite of that which we should attach to it.   *Masok-na sapwi*, 10-from 3, is not 3 from 10, 7, as we should read it, but 3 counting onward from 10, i. e. 13.

(11) It is interesting that the word *noko*, arrow, varies in numerical significance between 10, 11, and 12:

   10, Northwestern, Mooretown, *penim nokom*, 2 arrows, = 20.

   11, Northwestern, Konkau, *wikem nokom*, 1 arrow, = 10; but: *pe-ni-wikem-noko*, two-with-one-arrow, or, as we should say, two beyond [the last unit (10) toward] 1 arrow (11), = 12 (*sic*).

   12, Northwestern, Mooretown, and Northeastern, Genesee, *wokem noko*, 1 arrow, = 12.

(12) The Northwestern Maidu near Chico counted from 1 to 20 like the Konkau, with the exception of:

11 *wik-ni hiwali*, 1-with 15.	13 *sapwi-ni hiwali*, 3-with 15.
12 *pe-ni hiwali*, 2-with 15.	14 *tsöye-ni hiwali*, 4-with 15.

(13) The following variations have been observed within the Southern Maidu dialect:

At Swede's Flat:

   9 *peliom*, as in Northeastern and Northwestern dialects.
   11 *wikte-ni wikem-noko*, as in Northwestern dialect at Mooretown.

At Twelve Mile:

9 *peliom*.	12 *matsan pen*, ten two.
11 *matsan witte*, ten one.	13 *matsan sapwi*, ten three, etc.

At Sacramento:

16 *hial-t-aka*.	30 *matsa-ni pen*, ten-with forty.
17 *hiwal-ban-aka*.	40 *peni-wie*, 2-wie.
18 *hiwa-sp-aka*.	50 *matsa-ni sapwie*, ten-with sixty.
19 *tsöi-ni maiduk*, four-with man.	60 *sap-uye*, 3-wie.
20 *kum maiduk*, whole man.	

(14) Compare Northwestern Maidu 5 and Southern Maidu 10 : *ma-tsani*.

(15) Compare Maidu 5, *ma-wika*, with Miwok *ma-hoka, masoka*, 5.

(16) Northeastern Maidu :

11	10-from 1.	14	10-from 4.
12	1-arrow.	15	10-from 5.
13	10-from 3.		

(17) For 20, Southern Maidu, Spanish Flat, uses also

witem maiduk, 1 man ;   *pen-pai matcam*, 2-*times* ten.

(18) An analysis of the Northwestern and Southern Maidu numerals is given in the following table :

ANALYSIS OF MAIDU NUMERALS

	Northwestern Konkau	Northwestern Mooretown	Southern Spanish Flat
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	hand-tsani (?)	hand-1 (?)	hand-1 (?)
6	3-double	3-double	to-mbo
7	5-2	[7 = topwi, 3 = sapwi]	to-pwi
8	4-double	2-4	2-4
9	4-with-10	2-liom	2-lio
10	hand-double	hand-double	hand-tsani
11	1-arrow	1-with 1-arrow	hi-woto
12	2-with-1-arrow	1-arrow	2-woto
13	3-with-15	3 botam	3-with-al
14	4-with-15	4 botam	4-with-al
15	15 = hiwali	10 5	15 = hiwal
16	1-with-man-1	10 6	oiseto
17	2-with-man-1	etc.	2-with-man
18	3-with-man-1		3-with-man
19	4-with-man-1		4-with-man
20	man-1	2 arrow	whole-man, 1-man, or 2-*times*-10
21			
30	10-with 2-man	3 ten	3-10
40	2-man		4-10
50	10-with 3-man		
60	3-man		

(19) For -*mama, -momo, -mumu*, or -*mimu*, a form -*muyu* has also been obtained.

(20) Cf. Wintun 8, *seLawi*.

(21) It is not unlikely that this method of counting from 11 to 19 by expressed addition to 10 is recent. A similar method is followed in

most Valley and Foothill dialects today, yet the older people generally use or remember the shorter derivative forms here given.

(22) The Shoshonean dialects of Southern California appear to develop their higher numerals from a few simple elements by very transparent methods. This is evident in the Gabrielino table given, which is taken from Ried's list in the *California Farmer* (XIV, 146, January 11, 1861). *Wehe-s* is twice, *pahe-s* is thrice, etc. The Luiseño, according to the late Mr P. S. Sparkman, follows methods that are even more primitive and variable. There are simple numerals only to five. Every higher number is denoted by a phrase which is nothing but the expression of an arithmetical operation. The choice of expressions used is particularly interesting. Six may be expressed by 'again one,' or by 'another besides one,' or by 'five one upon,' or by 'besides my-hand one finger.' Eight is expressed in the same way, with the substitution of 'three' for 'one.' Ten is again the same, with 'five' instead of 'one.' Or, to denote ten, it is possible to say 'my-hand finished both,' or 'all my-hand finished.' The following are terms for higher numbers :

> 10, my-hand finished both.
> 20, another finished my-foot the-side.

> 10, all my-hand finished.
> 15, all my-hand finished and one my-foot.
> 25, all my-hand my-foot finished and another five.
> 40, all my-hand my-foot finished again all my-hand my-foot finished.

> 40, twice my-hand my-foot finished.
> 80, four-times all my-hand my-foot finished.
> 100, five-times all my-hand my-foot finished.
> 200, again five-times all my-hand my-foot finished.

> 11, besides other my-hand one finger.
> 16, besides my-foot one finger (= toe).
> 21, besides other my-foot one finger (= toe).

> 11, twice five one upon.
> 16, thrice five one upon.
> 20, four-times five.
> 30, five-times five, five upon.
> 71, five-times five, another five-times five, and four-times five, one upon.

While multiplication is freely used for the formation of higher numbers, the highest multiplier used is five. With this, higher units of twenty-five are formed, which are added together to express the numbers below one hundred ; or a unit of twenty is formed by some phrase such as 'all my-hand my-foot finished,' and this is raised by multiplication to one hundred, or, by the use of a phrase such as 'again five,' to two hundred. What is most interesting is that these numbers are reached without the use of a numeral higher than five.

(23) San Luis Obispo Chumash for 1 and 4 resemble 4 and 1 respectively in other dialects; *ckomo*, 8, occurring only in this dialect, is from the common root for 2 and 4.

(24) This Chumash form for 1, *paka*, is probably related to Esselen *pek*, and to the *puku* which neighboring Gabrielino alone shows for 1 among all the Shoshonean dialects.

(25) The aboriginal way of counting was evidently the same in Chumash as in Salinan : to 16 as the first higher unit, and then presumably by multiplying this unit and adding to it. It is likely that the decimal forms from 20 up are due to white contact and influence; the same is very probable for the Santa Ynez forms from 11 to 19, which were recorded many years after the corresponding forms in the other dialects.

(26) Compare Miwok 7, *kenekak*.

(27) Compare Miwok 3, *teloko*.

(28) The very interesting Salinan system is at once quaternary and multiplicative in method. The highest unit-term obtained is 16, as in the neighboring Chumash languages. *Pai-nel* and *ca-nel*, 6 and 8, are derived from *La-pai* and *ki-ca*, 3 and 4; *ki-* is evidently not part of the stem (though it appears in *ka-ki-ce*, 2), for Sitjar gives *tol* for 1 (Hale *ki-tol*), and *ke-te* for 7 (Hale *te*). The *t·* in *ult·ao*, 5, is nearly *tr*. 9, *teta-tsoi*, appears to contain 1, *tol*, and 10, *tsoe*. 12, *Lapai-kca*, is 3–4, and 15 is 3–5; 11 and 13 are 10 and 1 and 12 and 1; 14, like 7, is unanalyzable. The simple numeral stems would therefore seem to be : *tol*, 1; *ca*, 2 or 4; *pai*, 3; *ult·ao*, 5; *te*, 7; *tsoe*, 10; *wococo*, 14; *kpec*, 16.

(29) In *Wheeler Survey*, VII, 457, vocabulary 28, the Diegueño numerals are thus given :

1, *khink*.	8, *niok-hamuk* (cf. 3).
2, *oak*.	9, *ni-tchibab* (cf. 4).
3, *hamok*.	10, *selgh-iamat*.
4, *tchibabk*.	11, *nie-khin*.
5, *selkh-akai*.	12, *niekhvab gushbaib* (twice 6 ?).
6, *niu-gushbai*.	20, *selgh-hoak* (10–2).
7, *niok-hoak* (cf. 2).	

(30) The Shasta also use the following system in counting above twenty : 20, *tsec*, one-man ; 30, *tsectsim etsehewi*, one-man-tsim-ten ; 40, *xoka-hic*, two-man ; 50, *xoka-hic etsehewi*, two-man-ten ; 60, *xatsk-ic*, three-man ; 70, *xatsk-ic etsehewi*, three-man-ten ; 80, *iraha-ic*, four-man ; 90, *iraha-ic etsehewi*, four-man-ten ; 100, *aitsa-ic*, aitsa-man.

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